

# Approach to kidney stones associated with ureteropelvic junction obstruction during laparoscopic pyeloplasty

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**Introduction.** We have performed laparoscopic pyeloplasty (LP) in our department since 2004. Our goal is to describe, step by step, the approach of kidney stones during transperitoneal laparoscopic pyeloplasty and the outcomes after the procedure.

**Material and methods.** Twelve patients with kidney stones treated by transperitoneal laparoscopic pyeloplasty were found. The hospital records with clinical features, supplementary tests, and imaging studies were reviewed for demographic, procedural, and efficacy data.

**Results.** Kidney stones were found in 12 of 62 patients (19%) who had undergone transperitoneal laparoscopic pyeloplasty. Eight cases were treated using a flexible cystoscope and a nitinol N–Circle basket; in the remaining four cases the stones were extracted using laparoscopic grasping instruments. We want to emphasize a case of horseshoe kidney associated with ureteropelvic junction (UPJ) obstruction and a kidney stone in which the procedure was performed successfully.

**Conclusions.** Laparoscopic pyeloplasty has now emerged as a standard approach to UPJ obstruction. Associated renal abnormalities or kidney stones add complexity to the procedure, however, as shown in our results, centers with experience in the laparoscopic approach of reconstructive urology make this technique feasible.

**Key Words:** kidney stones ♦ laparoscopic pyeloplasty ♦ horseshoe kidney ♦ reconstructive urology

## INTRODUCTION

Ureteropelvic junction (UPJ) obstruction is the most common congenital abnormality of the ureter, with an annual incidence of 5 per 100,000 population [1]. For many years, open pyeloplasty has remained the ‘gold standard’ treatment, with success rates greater than 90%.

A 70-fold increased risk of developing kidney stones in UPJ obstruction has been estimated by Husmann et al. [2]. Traditionally, urinary stasis and infection have been proposed as the causes of the increased incidence of nephrolithiasis in patients with UPJ obstruction. This may worsen symptoms such as pain, fever, throughout the course of upper and lower urinary tract infections.

During the last two decades, multiple minimally invasive methods have been used for the surgical man-

agement of UPJ obstruction, including endopyelotomy, endopyeloplasty, laparoscopic pyeloplasty, and robotic pyeloplasty. Nowadays, minimally invasive procedures have replaced the open surgery in most centers, but the association of a secondary lithiasis can complicate the procedure.

We have performed laparoscopic pyeloplasty (LP) in our department since 2004 [3]. Our goal is to describe, step by step, the approach to kidney stones during transperitoneal laparoscopic pyeloplasty and the outcomes after the procedure.

## MATERIALS AND METHODS

We performed a retrospective review of our series [3]. Twelve patients with kidney stones treated by transperitoneal laparoscopic pyeloplasty were found. The hospital records with clinical features, supple-



**Figure 1.** Kidney stone extracted by laparoscopic grasping instruments.

mentary tests, and imaging studies were reviewed for demographic, procedural, and efficacy data. A descriptive analysis was made at our biostatistics facility using SPSS statistic software. Measures are given in terms of mean, median, percentage, standard deviation, and range.

### Surgical technique

Adding to our described technique by Gómez et al [3], once the renal pelvis is dissected and the ureteropelvic junction (UPJ) is opened, the next step is stone removal, which depends on the size, number and location of the stone(s). If the stone lies in the renal pelvis it can be picked up with laparoscopic grasping instruments (Figure 1) but if it lies in a distant calyx, a flexible instru-

ment is more useful (Figure 2). A flexible cystonephroscope can be introduced through an available working port. Usually a port that is well aligned with the pelvis or ureter should be chosen for passing the instrument. The stones in this case are removed with a nitinol N-Circle basket (Cook Surgical, Bloomington, Ind).

### RESULTS

Kidney stones were found in 12 of 62 patients (19%) who had undergone transperitoneal laparoscopic pyeloplasty. The mean age of the patients was 44.54 years (range: 33–67).

Patients consulted at least once to the emergency room because of pain or urinary tract infections. A complete physical examination, complete blood analysis, urine culture, intravenous urography (IVU) (Figure 3), and diuretic renography with MAG-3 were performed in all patients in order to diagnose UPJ obstruction. Antibiotics to specific positive bacteria cultures were administered prior to surgery in three cases, in the other nine cases prophylaxis with Augmentin 2 g were given 30 minutes prior to surgery.

The average operative time was 147 minutes (range 122 to 172 minutes). The mean estimated blood loss was 60 ml (range 30 to 100 ml) and no patients required blood transfusion.

Eight cases were treated using a flexible cystoscope and a nitinol N-Circle basket through it (Figure 2); in the remaining four cases the stones were extracted using laparoscopic grasping instruments (Figure 1). We want to emphasize a case of horseshoe kidney associated with UPJ obstruction and a kidney stone in which the procedure was performed successfully (Figure 3 and 4).

The median size of the stones was 1.53 cm (SD: 0.32). The compositions of the stones were: 56% calcium oxalate, 33% uric acid and 11% magnesium ammonium



**Figure 2.** Kidney stone extracted by a nitinol N-Circle basket through a flexible cystonephroscope.



**Figure 3.** Pre surgical IVU of a horseshoe kidney associated with UPJO and a kidney stone.



**Figure 4.** Post surgical IVU of patient in figure 3 showing resolution of the UPJO and kidney stone.

phosphate. The average stone weight: 539 mg (SD: 170.4). The median post-surgical hospital stay was 3.36 days (range 3–5 days).

Success of the procedure was measured by resolution of symptoms, radiographic improvement in IVU (Fig-

ure 4). This was demonstrated by the appearance of increase in the excretion of contrast. The resolution of the obstructive pattern in the diuretic renography six months after surgery was noted in eleven cases (91.6%). One case had a secondary UPJ obstruction

without any kidney stones in the IVU 6 months after surgery. Endourological approach was performed successfully in this case.

## DISCUSSION

The first choice for treating stones in the renal pelvis is an endourological approach: but laparoscopy and robotic surgery have a role in renal units having concomitant UPJ obstruction or renal units bearing a large stone in the pelvis.

The European Association of Urology Guidelines on Urolithiasis (2013 edition) [4] indicate that laparoscopic surgery should be considered as a treatment option before offering open surgery, whenever expertise is available, and in anatomical abnormalities such as horseshoe kidney. Only Stein et al. [5] references a laparoscopic approach in this pathology in 2007. In our series we have a case of horseshoe kidney associated with UPJ obstruction and a kidney stone. This case was solved successfully using LP, showing that regardless of the complexity of the case, the transperitoneal laparoscopic approach to the PUJ junction offers the necessary guarantees for the treatment of the UPJO with associated secondary lithiasis. The versatility of laparoscopy allows us to combine this technique with endoscopic instruments for better treatment.

In a series published about laparoscopic stone removal, the main indication for it was renal stones with concomitant UPJ obstruction [6, 7, 8]. However, the problem in these series is the low number of patients. The largest series published using this approach in lithiasis associated with UPJ obstruction is from

Ramakumar et al. [9], where 19 patients (20 renal units) with symptomatic ureteropelvic obstruction and non-obstructing renal stones underwent laparoscopic pyeloplasty with concomitant pyelolithotomy. They concluded that although LP is a technically demanding procedure, concomitant pyelolithotomy can be performed safely. For the laparoscopist with experience in pyeloplasty the procedure is relatively straightforward even for multiple stones.

Worldwide experience with LP reaches success rates range from 88% to 100% [10–14]. Since laparoscopic reconstructive surgery has evolved in our department [3, 15, 16, 17], more complex cases are performed by laparoscopic approach. Our goal is to keep heading in this direction in order to contribute to the development of urology in this field.

## CONCLUSIONS

LP has now emerged as a standard approach to UPJ obstruction. Associated renal abnormalities or kidney stones add complexity to the procedure, however, as shown in our results, centers with experience in the laparoscopic approach of reconstructive urology makes this technique feasible.

## ABBREVIATIONS

UPJ – ureteropelvic junction

LP – laparoscopic pyeloplasty

UPJ – ureteropelvic junction

SPSS – Statistical Product and Service Solutions

IVU – intravenous urography

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